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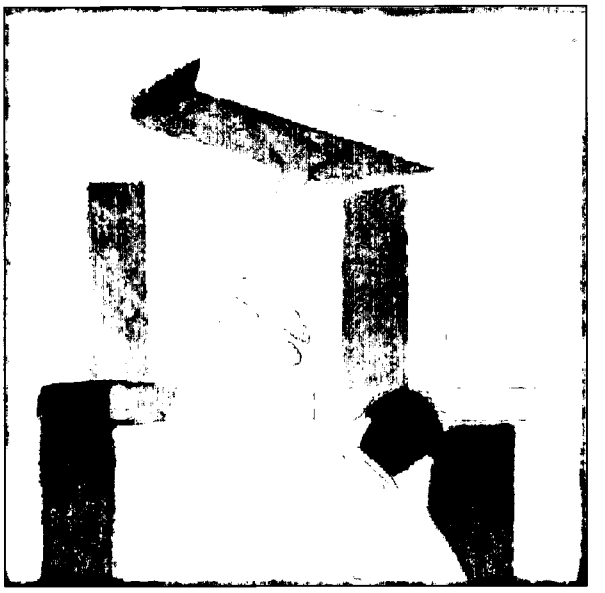
ABSTRACT

During the research phase for the Millennium Edition of "Building a Foundation for Tomorrow: Skill Standards for Information Technology", data was gathered from a wide range of information technology (IT) professionals on the math and science skills required or recommended for IT students. A survey was conducted to identify which specific areas of math and science are most beneficial to IT professionals, and as result should be included in IT education and training programs. This document presents the survey results identifying which math and science skills are important to IT training and education. Specific math and science concepts and tools are correlated to the IT career cluster areas to which they most often apply and are presented in tables. An outline of the Northwest Center for Emerging Technologies (NWCET) IT Core Curriculum program outcomes is offered. A map representing the relationships between critical math and science skills and learner program outcomes from the NWCET IT Core Curriculum is also included. This document supports the review, evaluation, and integration of math and science skills in IT education and training programs. (ASK)



Tools & Frameworks

MAPPING MATH & SCIENCE OUTCOMES TO IT CURRICULUM

NWCET

NORTHWEST CENTER *for* EMERGING TECHNOLOGIES

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please contact NWCET.

For more information, contact:
NorthWest Center for Emerging Technologies
3000 Landerholm Circle SE, N258
Bellevue, WA 98007-6484

Web: *www.nwcet.org*
Email: *nwinfo@bcc.ctc.edu*
Phone: (425) 564-4215
Fax: (425) 564-6193

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Mapping Math and Science Outcomes to IT Curriculum

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Overview

Background

During the research phase for the Millennium Edition of *Building a Foundation for Tomorrow: Skill Standards for Information Technology*, data was gathered from a wide range of information technology (IT) professionals on the math and science skills required or recommended for IT students. Not surprisingly, the level of specific math and science skills varied directly with the level of educational attainment sought.

While experts have varying opinions on the exact scope and proportion of specific math and science content, there is a high level of agreement on what outcomes are desired. In other words, there is significant consensus that everyone desires the benefits of the thought, reasoning, observational and analytical processes that math and science courses can instill.

A survey was conducted to identify which specific areas of math and science are most beneficial to IT professionals and as a result should be included in IT education and training programs. The math and science skills that were identified based on the survey results as important to IT education were mapped specified in the outcomes of the NWCET IT Core Curriculum. See the NWCET *Information Technology Core Curriculum* document for a detailed list of outcomes and competencies. This map shows excellent overlap between the IT Core curriculum outcomes and the math and science skills. This demonstrates that a program design based on the NWCET IT Core Curriculum supports the attainment of critical math and science skills.

The methods by which students acquire math and science skills vary from well-developed, discrete courses, all the way to "embedded" content-supporting technical instruction. Preliminary analysis suggests that development of an information technology-specific math and science core course may ensure that required concepts and skills are, in fact, taught and accurately assessed. In some cases however, it may not be practical to offer a discrete math and science course. An effective option is to identify specific elements of math and science that support topic areas and to embed these elements in their related courses, so long as they are appropriately assessed. The NWCET IT Core Curriculum provides a venue to infuse math and science concepts into an IT training program.

This report presents:

- The survey results identifying which math and science skills are important to an IT training program (Appendix A);
- Tables relating specific math and science concepts and tools to the career cluster areas (see *Building a Foundation for Tomorrow: Skill Standards for Information Technology*) to which they most often apply (Appendix B);
- An outline of the NWCET IT Core Curriculum Program Outcomes (Appendix C);
- A map representing the relationships between critical math and science skills and the NWCET IT Core Curriculum outcomes (Appendix D).

The information presented in this report can be used in the following ways:

- To justify the inclusion of math and science skills and concepts in IT curriculum;
- To identify which math and science skills and concepts are most relevant to specific IT training programs;
- To document which math and science skills are taught to and demonstrated by students completing a program based on the NWCET IT Core Curriculum design.

For further information on integrating math and science skills and concepts into IT education and training programs, please refer to the following NWCET documents: *Science Skills for Technical Support Module* and *Math and Science for Media Technology Module.*

Math and Science Survey

The purpose of this survey was to identify areas of math and science that strongly support IT programs. The survey questions focused on math and science processes (such as "analytical and logical thinking"), as well as math and science content (such as "arithmetic concepts and tools").

Survey Design

Industry professionals (across the 8 IT career clusters described in *Building a Foundation for Tomorrow: Skill Standards for Information Technology*) were surveyed to find out about their work-related usage of math and science tools and concepts. An electronic survey, designed using specific learning outcomes identified in the NWCET IT Core Curriculum, was sent to a directed sample of in-depth interview and focus group participants. Surveyed professionals were asked to indicate how often they used the specific math or science concept or skill (competency areas) in their job, using this scale:

0 - Almost never; 1 - Seldom; 2 - Sometimes/Occasionally; 3 - Often; 4 - Frequently/Almost Daily

Responses were generated for each of the following 7 math and science categories (covering a total of 61 competency areas):

- Analytical and Logical Thinking (6 competency areas)
- Conceptualization, Pattern Recognition and Modeling (8 competency areas)
- Data Gathering, Organization and Analysis (5 competency areas)
- Hypothesis Development and Experiment Design (3 competency areas)
- Problem Solving (3 competency areas)
- Arithmetic Concepts and Tools (20 competency areas)
- Science Concepts and Tools (16 competency areas)

The results summarized and presented in Appendix A reflect data received.

Survey Results

There is substantial agreement that industry values the ability to conceptualize, to gather and organize data, to recognize consistency and think analytically, to solve problems and troubleshoot, and to make judgments based on quantitative relationships (such as cost-benefit analysis). Even though specific areas of math and science content were reported as being used "often" or "frequently" in certain IT career clusters, in general content was rated lower than process skills.

A summary of the survey responses (averaged over all survey respondents for math and science skills/concepts) is presented in Appendix A. The following areas of math and science were rated particularly high:

- Analytical and Logical Thinking
- Data Gathering, Organization and Analysis
- Problem Solving

The survey results were also analyzed to identify math and science concepts and tools most often cited as supporting specific IT skill clusters. This information is presented in Appendix B. The tables show that all IT skill clusters are supported by a wide range of math concepts and tools, while only half of the clusters strongly rely on the use of specific science concepts and tools.

The NWCET will conduct further studies to determine what core math and science concepts pertain to the information technology industry at large, and what specific math and science elements are recommended for community college students who intend to transfer to university or for working professionals seeking graduate level education.

Mapping to IT Core Curriculum Program Outcomes

In 1999, the NWCET published its *Information Technology Core Curriculum*. This curriculum was derived from the IT Skill Standards and includes a detailed list of learner outcomes and competencies for an IT core program. After the math and science survey results were analyzed, an assessment of the correlation between the math and science skills deemed important by industry and the IT core outcomes was conducted. The purpose of this study was to evaluate the effectiveness of the IT Core Curriculum in covering these math and science skills.

The IT Core Curriculum outcomes are listed in Appendix C. These outcomes are organized in the following categories:

- Project and Process Flow Skills
- Coordination and Communication Skills
- Business Environment Skills
- Analytical Skills and Problem Solving
- Core Computer Software and Hardware Skills

The math and science skills that rated important (2.75 or higher on the survey scale) are mapped to the IT Core Curriculum outcomes, and included in Appendix D. Shaded areas represent areas of strong correlation.

The IT core outcomes that showed the highest level of correspondence with math and science skills are in the following skill areas:

Project and Process Flow Skills
- Research
- Analysis and Synthesis
- Proposal Writing
- Planning and Organization
- Design and Development
- User Testing and Validation

Coordination and Communication Skills
- Customer Relations
- Task Management
- Project Management

Analytical Skills and Problem Solving
- Problem Solving
- Analytical and Logical Thinking
- Data Gathering, Analysis and Organization
- Hypothesis Development and Design of Experimentation
- Estimation and Cost/Benefit Analysis
- Statistical Analysis

Core Computer Software and Hardware Skills
- Windows Environment
- Hardware Installation and Configuration
- Software Installation and Configuration
- Network Technologies
- Spreadsheet Applications
- Principles of Programming

APPENDIX A:
Overall Math and Science Survey Summary

Overall Math and Science Survey Summary

How Often Do IT Professionals Use These Math & Science Tools and Concepts?

Analytical and Logical Thinking ➢ Using logic as a reasoning and critical evaluation tool in problem solving and decision making; ➢ Recognizing and correcting logical flaws in analyses and arguments.	
Reason using relationships among propositions in terms of implication and contradiction	3.22
Recognize consistency and inconsistency; recognize and resolve ambiguous statements	3.52
Identify testable implications of hypotheses, to make logical connections between differing hypotheses	2.83
Simplify the analysis of complex situations by recognizing internal components and structures	3.26
Classify problems	3.35
Sustain a consistent approach in complex, multi-step solutions	3.39
Conceptualization, Pattern Recognition and Modeling ➢ Recognizing and building on approximate parallels between superficially different situations; ➢ Applying and manipulating abstract representations; ➢ Developing and applying abstract models of concrete situations.	
Apply appropriate abstract concepts to concrete situations	2.74
Distinguish between fundamental and incidental features of a concrete situation	2.91
Recognize patterns from discrete instances	3.17
Generalize from specific instances to general features, formulas, etc.	2.78
Apply appropriate general models to specific instances	2.70
Create algebraic, geometrical or graphical models representing data relationships	1.52
Use models productively as tools for generating and refining hypotheses and for predicting results	1.87
Make critical judgments concerning the universality or limits of generalizations	2.39
Data Gathering, Organization and Analysis ➢ Developing a valid empirical basis for decision making; ➢ Applying logical and statistical tools to reach a valid conclusion from available data; ➢ Identifying and estimating uncertainties in a conclusion based on empirical data.	
Identify and characterize needed data and to judge (in)sufficiency for task	2.91
Observe, organize and record data	2.70
Recognize unexpected evidence	3.35
Judge the reasonableness of results	3.43
Evaluate and analyze data leading to conclusions and decisions	3.09

Hypothesis Development and Experiment Design ➢ Framing an hypothesis as a troubleshooting tool or as an aid for understanding a concrete situation; ➢ Planning an experimental or observational test of hypotheses.	
Construct a hypothesis from which an experiment could be designed	1.74
Specify the data that would support or contradict a hypothesis	2.04
Design an experiment or observation to test a hypothesis, validate results, understand control factors	2.35
Problem Solving ➢ Identifying essential features of a complex phenomenon; ➢ Approaching unfamiliar problems in an efficient and systematic manner, appropriately applying past experience and knowledge; ➢ Extending past experience with creative and innovative approaches.	
Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	3.48
Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	3.74
Brainstorm to challenge assumptions, to frame and answer "What if .." questions, to suspend judgment pending appropriate tests	3.43
Arithmetic Concepts and Tools ➢ Correctly computing and interpreting ratios and percentages; ➢ Correctly using scientific notation, exponents and logarithms; ➢ Using and converting among decimal, binary and hexadecimal representations in appropriate contexts.	
Measurement	
Express, manipulate and calculate using measured quantities in appropriate units	2.17
Critically evaluate conclusions based on measured quantities	1.83
Algebraic Concepts and Tools	
Generate formula or equation from verbal or pictorial description of a concrete situation	1.35
Translate formula or equation into verbal or pictorial description of a concrete situation	1.35
Apply proper algebraic techniques in solving mathematical problems	1.57
Use algebraic representations as a tool for qualitative reasoning (e.g., rates and ratios, distinguishing between direct and inverse relationships, etc.)	1.87
Computation	
Accurately perform mathematical operations, using appropriate software (e.g., spreadsheets)	2.35
Estimation and Cost/Benefit Analysis	
Apply estimation techniques in business situations	2.57
Apply statistical techniques to analyze variables	1.83

Geometric Concepts and Tools	
Develop and interpret geometrical data (e.g., spatial layouts)	1.17
Apply basic geometrical principles in the analysis of graphs	1.26
Graphing	
Produce and interpret graphs	1.91
Interpret and analyze graphs	2.43
Relational Algebra	
Apply basic operations in the design of database queries	1.91
Statistical Analysis	
Apply basic probability theory	1.26
Identify statistical data distributions	1.35
Produce statistical descriptions from data	1.17
Apply hypothesis testing techniques to a data set	1.04
Trigonometric Concepts and Tools	
Apply basic trigonometric tools in concrete contexts (e.g., spatial measurements)	0.39
Apply basic trigonometric tools in abstract models (e.g., phase relations in AC circuits)	0.39
Science Concepts and Tools ➢ Correctly using scientific concepts and tools.	
Animation Realism	
Apply physics principles in the accurate representation of motion	0.26
Basic Electricity and Magnetism	
Apply fundamental concepts and tools of DC circuit analysis	0.35
Apply fundamental concepts and tools of AC circuit analysis	0.35
Apply basic magnetism principles in the technology of magnetic data storage	0.39
Data Transmission	
Apply basic principles of optical and RF signal transmission	0.65
Identify, distinguish and evaluate among (both analog and digital) encoding techniques	0.57
Identify and analyze sources of interference	0.78
Integrated Circuits	
Apply basic concepts of semiconductor device operation	0.30
Analyze basic IC logic circuits	0.26
Apply troubleshooting techniques for IC devices	0.26
Optics and Vision	
Apply principles of additive and subtractive color combination	0.74
Apply understanding of human visual perception to computer graphic design	1.30
Apply geometric principles to 2-D representation of 3-D objects	0.91
Apply optical principles in the use of cameras and other imaging systems	0.57
Sound	
Apply analog and digital encoding techniques	0.57
Evaluate bandwidth and frequency response requirements in audio processing	0.74

APPENDIX B:

- **Specific Math Concepts and Tools Most Often Cited as Supporting IT Skill Clusters**

- **Specific Science Concepts and Tools Most Often Cited as Supporting IT Skill Clusters**

Specific Math Concepts and Tools Most Often Cited as Supporting IT Skill Clusters

	Database Development and Administration	Digital Media	Enterprise Systems Analysis and Integration	Network Design and Administration	Programming/ Software Engineering	Technical Support	Technical Writing	Web Development and Administration
Arithmetic Concepts and Tools								
Measurement								
Algebraic Concepts and Tools								
Computation								
Estimation and Cost/ Benefit Analysis								
Geometric Concepts and Tools								
Graphing								
Relational Algebra								
Statistical Analysis								
Trigonometric Concepts and Tools								
Logic								

Specific Science Concepts and Tools Most Often Cited as Supporting IT Skill Clusters

	Database Development and Administration	Digital Media	Enterprise Systems Analysis and Integration	Network Design and Administration	Programming/ Software Engineering	Technical Support	Technical Writing	Web Development and Administration
Animation Realism								
Basic Electricity and Magnetism								
Data Transmission								
Integrated Circuits								
Optics and Vision								
Sound								

APPENDIX C:
IT Core Curriculum Program Outcomes

IT Core Curriculum Program Outcomes

(Excerpted from the NWCET *Information Technology Core Curriculum.*)

Project and Process Flow Skills

Research

- Identify and use traditional and non-traditional sources of information
- Apply effectively and choose appropriately from a variety of research methods and tools
- Analyze, organize and present research material

Analysis and Synthesis

- Gather data to identify project requirements, and to interpret and evaluate the requirements
- Identify constraints, generate alternatives, consider risks and evaluate options
- Define the scope of work to meet project requirements and constraints, and develop a project outline

Proposal Writing

- Explain the necessary elements of a proposal and their respective purpose
- Develop a proposal that meets the client's requirements and effectively presents the phases of the project

Planning and Organization

- Develop a project plan that is realistic and that effectively serves the project goals
- Organize the different phases of the project in an efficient manner

Design and Development

- Apply the design and development process from beginning to end
- Evaluate and assess the effectiveness of the design and development process

User Testing and Validation

- Develop and implement an effective testing and user validation program that supports all phases of the development process

Technical and Project Documentation

- Select and use technical documentation formats meeting the intended purpose and the guidelines of the organization
- Develop effective and accurate technical documentation appropriate to various audiences and purposes

Quality Assurance

- Explain and apply quality assurance processes as they relate to the development process
- Discuss quality issues in a technology organization

Coordination and Communication Skills

Oral and Written Communication

- Select and evaluate appropriate communication strategies and styles for a specific purpose
- Develop effective written communication, and develop and deliver effective oral presentations
- Effectively adapt communication strategies and styles to specific audiences

Customer Relations

- Effectively listen and ask critical questions to identify customer issues and concerns
- Resolve customer issues and concerns in a timely and appropriate manner

Teamwork

- Work collaboratively in a team setting
- Work and communicate effectively with people of different backgrounds and expertise in a group environment
- Recognize expertise and learn from others

Task Management

- Organize multiple tasks in the most effective way, and allocate time and energy according to task complexity and priority
- Evaluate task outcomes and continuously improve organization process

Project Management

- Explain the basic terminology, principles and techniques of project management
- Select, implement and evaluate appropriate project management techniques and tools
- Effectively adapt project management techniques to specific situations

Business Environment Skills

Business Organization and Environment

- Present and discuss contemporary business principles, practices and organization
- Present and discuss how computer systems impact the operation and management of business and society

Computer Trends in Business and Society

- Discuss the issues affecting the selection of a computer system for a specific environment
- Present current computer technology and systems trends
- Discuss the impact of information technology on society and the workplace

Principles of Accounting

- Explain and apply basic accounting principles
- Explain how computer applications support the financial workings of a business organization

Professionalism
- Demonstrate successful work environment-related attitudes and skills
- Establish and maintain professional relationships

Professional Development
- Identify and close gaps between one's knowledge and skills, and those required by the situation
- Identify sources of learning/training most appropriate for the topic and context, and for one's personal learning style
- Formulate and implement a personal development plan

Analytical Skills and Problem Solving

Problem Solving
- Select, implement and evaluate appropriate problem solving techniques and tools
- Effectively adapt problem solving techniques to specific situations

Analytical and Logical Thinking
- Apply analytical and logical thinking to gathering and analyzing information, designing and testing solutions to problems, and formulating plans

Conceptualization
- Visualize and articulate complex problems and concepts

Data Gathering, Analysis and Organization
- Gather, analyze and organize data using a logical and systematic process

Pattern Recognition and Modeling
- Recognize patterns in complex sets of data and develop practical models

Hypothesis Development and Design of Experimentation
- Develop hypotheses and design test experiments

Estimation and Cost/Benefit Analysis
- Develop estimates and projections, to conduct cost/benefit analysis on specific alternatives

Statistical Analysis
- Apply statistical methods to analyze and resolve business and technical problems

Core Computer Software and Hardware Skills

Windows Environment
- Perform basic operations and troubleshoot basic problems in a Windows environment
- Customize the operating system environment
- Run multiple applications at the same time, and import and export data between applications

Hardware Installation and Configuration
- Name individual parts that make up a stand-alone PC computer system, and describe the relationships between components
- Install and configure hardware in a PC computer system
- Perform basics of PC hardware troubleshooting and maintenance

Software Installation and Configuration
- Install software programs and perform basic configuration operations
- Explain software and hardware compatibility issues
- Troubleshoot basic configuration problems

Network Technologies
- Present the characteristics of overall design and components of a LAN and WAN system
- Perform basic setup and configuration of network hardware and software

E-mail
- Explain basic e-mail system components and organization
- Use e-mail effectively and appropriately

Internet
- Use the Internet as a research tool in an efficient manner
- Create and maintain Web pages

Word Processing
- Use basic word processing features, such as document formatting, editing and using tables
- Create simple word processing documents such as letters, memos and basic reports
- Create compound documents, such as newsletters, with graphics and objects from multiple software applications

Spreadsheet Applications
- Design, create, modify and troubleshoot spreadsheets
- Create graphs and charts
- Apply spreadsheet principles to real-life situations and to solve business problems

Presentation Software
- Use the components of presentation software creatively and effectively
- Demonstrate proficiency in using presentation software functions

Database Applications
- Define and use the basic terminology of relational databases
- Use the tools and skills needed to create and utilize databases

Principles of Programming
- Present basic programming principles and explain programming structures
- Design, code, build, test and troubleshoot basic custom applications

APPENDIX D:
Relationships Between Critical Math and Science Skills and IT Core Curriculum

Relationships Between Critical Math and Science Skills and IT Core Curriculum

Project and Process Flow Skills	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Research						
Identify and use traditional and non-traditional sources of information						
Choose appropriately from a variety of research methods and tools; apply selected method or tool effectively						
Analyze, organize and present research material						
Analysis and Synthesis						
Gather data toidentify project requirements and tointerpret and evaluate the requirements						
Identify constraints, generate alternatives, consider risks and evaluate options						
Define the scope of work to meet project requirements and constraints, and develop a project outline						
Proposal Writing						
Explain the necessary elements of a proposal and their respective purpose						
Develop a proposal to meet client's requirements and effectively presents the phases of the project						

Project and Process Flow Skills	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Planning and Organization						
Develop a project plan that is realistic and effectively serves the project goals						
Organize the different phases of the project in an efficient manner						
Design and Development						
Apply the design and development process from beginning to end						
Evaluate and assess the effectiveness of the design and development process						
User Testing and Validation						
Develop and implement an effective testing and user validation program that supports all phases of the development process						
Technical and Project Documentation						
Select and use technical documentation formats meeting the intended purpose and the guidelines of the organization						
Develop effective & accurate technical documentation appropriate to various audiences and purposes						

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Project and Process Flow Skills	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Quality Assurance						
Explain and apply quality assurance processes as they relate to the development process						
Discuss quality issues in a technology organization						

Coordination and Communication Skills	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Oral and Written Communication						
Select and evaluate appropriate communication strategies and styles for specific purposes						
Develop effective written communication; develop and deliver effective oral presentations						
Effectively adapt communication strategies and styles to specific audiences						
Customer Relations						
Effectively listen and ask critical questions to identify customer issues and concerns						
Resolve customer issues and concerns in a timely and appropriate manner						
Teamwork						
Work collaboratively in a team setting						
Work and communicate effectively with people of different backgrounds and expertise in a group environment						
Recognize expertise and learn from others						

Coordination and Communication Skills	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Task Management						
Organize multiple tasks in the most effective way, and allocate time and energy according to task complexity and priority						
Evaluate task outcomes and continuously improve organization process						
Project Management						
Explain the basic terminology, principles and techniques of project management						
Select, implement and evaluate appropriate project management techniques and tools						
Effectively adapt project management techniques to specific situations						

Business Environment Skills	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Business Organization and Environment						
Present and discuss contemporary business principles, practices and organization						
Present and discuss how computer systems impact the operation and management of business and society						
Computer Trends in Business and Society						
Discuss the issues affecting the selection of a computer system for a specific environment						
Present current computer technology and systems trends						
Discuss the impact of information technology on society and the workplace						
Principles of Accounting						
Explain and apply basic accounting principles						
Explain how computer applications support the financial workings of a business organization						

Business Environment Skills	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Professionalism						
Demonstrate successful work environment-related attitudes and skills						
Establish and maintain professional relationships						
Professional Development						
Identify and close gaps between one's knowledge and skills, and those required by the situation						
Identify sources of learning/training most appropriate for the topic and context, and for one's personal learning style						
Formulate and implement a personal development plan						

Analytical Skills and Problem Solving	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Problem Solving						
Select, implement and evaluate appropriate problem solving techniques and tools						
Effectively adapt problem solving techniques to specific situations						
Analytical and Logical Thinking						
Apply analytical and logical thinking to gathering and analyzing information, designing and testing solutions to problems, and formulating plans						
Conceptualization						
Visualize and articulate complex problems and concepts						
Data Gathering, Analysis and Organization						
Gather, analyze and organize data using a logical and systematic process						
Pattern Recognition and Modeling						
Recognize patterns in complex sets of data and develop practical models						

Analytical Skills and Problem Solving	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Hypothesis Development and Design of Experimentation						
Develop hypotheses and design test experiments						
Estimation and Cost/Benefit Analysis						
Develop estimates and projections, to conduct cost/benefit analysis on specific alternatives						
Statistical Analysis						
Apply statistical methods to analyze and resolve business and technical problems						

Core Computer Software and Hardware Skills	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Windows Environment						
Perform basic operations; troubleshoot basic problems in a Windows environment						
Customize the operating system environment						
Run multiple applications at the same time; import and export data between applications						
Hardware Installation and Configuration						
Name individual parts that make up a stand-alone PC system; describe relationships between components						
Install and configure hardware in a PC system						
Perform basics of PC hardware troubleshooting and maintenance						
Software Installation and Configuration						
Install software programs and perform basic configuration operations						
Explain software and hardware compatibility issues						
Troubleshoot basic configuration problems						

Core Computer Software and Hardware Skills	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Network Technologies						
Present the characteristics of overall design and components of a LAN and WAN system						
Perform basic setup and configuration of network hardware and software						
E-mail						
Explain basic e-mail system components/organization						
Use e-mail effectively and appropriately						
Internet						
Use Internet as a research tool in an efficient manner						
Create & maintain Websites						
Word Processing						
Use basic word processing features, such as document formatting, editing and using tables						
Create simple word processing documents (i.e., letters, memos, basic reports, etc.)						
Create compound documents (i.e., newsletters with graphics and objects from multiple software applications)						

Core Computer Software and Hardware Skills	Analytical and Logical Thinking					
	Reason using relationships among propositions in terms of implication and contradiction	Recognize consistency and inconsistency; recognize and resolve ambiguous statements	Identify testable implications of hypotheses, to make logical connections between different hypotheses	Simplify the analysis of complex situations by recognizing internal components and structures	Classify problems	Sustain a consistent approach to complex, multi-step solutions
Spreadsheet Applications						
Design, create, modify and troubleshoot spreadsheets						
Create graphs and charts						
Apply spreadsheet principles to real-life situations and to solve business problems						
Presentation Software						
Use the components of presentation software creatively and effectively						
Demonstrate proficiency in using presentation software functions						
Database Applications						
Define and use the basic terminology of relational databases						
Use the tools and skills needed to create and utilize databases						
Principles of Programming						
Present basic programming principles and explain programming structures						
Design, code, build, test and troubleshoot basic custom applications						

Project and Process Flow Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instances	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Research						
Identify and use traditional and non-traditional sources of information						
Apply effectively and choose appropriately from a variety of research methods and tools						
Analyze, organize and present research material						
Analysis and Synthesis						
Gather data to identify project requirements, and to interpret and evaluate the requirements						
Identify constraints, generate alternatives, consider risks and evaluate options						
Define the scope of work to meet project requirements and constraints, and develop a project outline						

Project and Process Flow Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instances	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Proposal Writing						
Explain the necessary elements of a proposal and their respective purpose						
Develop a proposal that meets the client's requirements and effectively presents the phases of the project						
Planning and Organization						
Develop a project plan that is realistic and that effectively serves the project goals						
Organize the different phases of the project in an efficient manner						
Design and Development						
Apply the design and development process from beginning to end						
Evaluate and assess the effectiveness of the design and development process						

Project and Process Flow Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instances	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
User Testing and Validation						
Develop and implement an effective testing and user validation program that supports all phases of the development process						
Technical and Project Documentation						
Select and use technical documentation formats meeting the intended purpose and the guidelines of the organization						
Develop effective and accurate technical documentation appropriate to various audiences and purposes						
Quality Assurance						
Explain and apply quality assurance processes as they relate to the development process						
Discuss quality issues in a technology organization						

Coordination and Communication Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instances	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Oral and Written Communication						
Select and evaluate appropriate communication strategies and styles for a specific purpose						
Develop effective written communication, and develop and deliver effective oral presentations						
Effectively adapt communication strategies and styles to specific audiences						
Customer Relations						
Effectively listen and ask critical questions to identify customer issues and concerns						
Resolve customer issues and concerns in a timely and appropriate manner						

Coordination and Communication Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instances	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Teamwork						
Work collaboratively in a team setting						
Work and communicate effectively in group environment w/ people of varying backgrounds and expertise						
Recognize expertise and learn from others						
Task Management						
Organize multiple tasks for effectiveness; allocate time/ energy according to task complexity and priority						
Evaluate task outcomes and continuously improve organization process						
Project Management						
Explain basic principles, terminology & techniques of project management						
Select, implement and evaluate appropriate project management techniques and tools						
Effectively adapt project management techniques to specific situations						

Business Environment Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instances	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Business Organization and Environment						
Present and discuss contemporary business principles, practices and organization						
Present and discuss how computer systems impact the operation and management of business and society						
Computer Trends in Business and Society						
Discuss the issues affecting the selection of a computer system for a specific environment						
Present current computer technology and systems trends						
Discuss the impact of information technology on society and the workplace						
Principles of Accounting						
Explain and apply basic accounting principles						
Explain how computer applications support the financial workings of a business organization						

Business Environment Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instances	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Professionalism						
Demonstrate successful work environment-related attitudes and skills						
Establish and maintain professional relationships						
Professional Development						
Identify and close gaps between one's knowledge and skills, and those required by the situation						
Identify sources of learning/training most appropriate for the topic and context, and for one's personal learning style						
Formulate and implement a personal development plan						

Analytical Skills and Problem Solving	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instances	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Problem Solving						
Select, implement and evaluate appropriate problem solving techniques and tools						
Effectively adapt problem solving techniques to specific situations						
Analytical and Logical Thinking						
Apply analytical and logical thinking to gathering and analyzing information, designing and testing solutions to problems, and formulating plans						
Conceptualization						
Visualize and articulate complex problems and concepts						
Data Gathering, Analysis and Organization						
Gather, analyze and organize data using a logical and systematic process						

Analytical Skills and Problem Solving	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instances	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Pattern Recognition and Modeling						
Recognize patterns in complex sets of data and develop practical models						
Hypothesis Development and Design of Experimentation						
Develop hypotheses and design test experiments						
Estimation and Cost/Benefit Analysis						
Develop estimates and projections, to conduct cost/benefit analysis on specific alternatives						
Statistical Analysis						
Apply statistical methods to analyze and resolve business and technical problems						

Core Computer Software and Hardware Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instance	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Windows Environment						
Perform basic operations and troubleshoot basic problems in a Windows environment						
Customize the operating system environment						
Run multiple applications at the same time, and import and export data between the applications						
Hardware Installation and Configuration						
Name the individual parts that make up a stand-alone PC computer system, and describe the relationships between the various components						
Install and configure hardware in a PC computer system						
Perform basics of PC hardware troubleshooting and maintenance						

Core Computer Software and Hardware Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instance	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Software Installation and Configuration						
Install software programs and perform basic configuration operations						
Explain software and hardware compatibility issues						
Troubleshoot basic configuration problems						
Network Technologies						
Present the characteristics of overall design and components of a LAN and WAN system						
Perform basic setup and configuration of network hardware and software						
E-mail						
Explain basic e-mail system components and organization						
Use e-mail effectively and appropriately						

Core Computer Software and Hardware Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instance	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Internet						
Use the Internet as a research tool in an efficient manner						
Create & maintain Web pages						
Word Processing						
Use basic word processing features (i.e. document formatting, editing, using tables etc.)						
Create simple word processing documents (i.e. letters, memos, basic reports etc.)						
Create compound documents (i.e. newsletters with graphics and objects from multiple software applications)						
Spreadsheet Applications						
Design, create, modify & troubleshoot spreadsheets						
Create graphs and charts						
Apply spreadsheet principles to real-life situations and to solve business problems						

Core Computer Software and Hardware Skills	Conceptualization, Pattern Recognition and Modeling			Problem Solving		
	Distinguish between fundamental and incidental features of a concrete situation	Recognize patterns from discrete instance	Generalize from specific instances to general features, formulas, etc.	Approach problems in a systematic way, to look for patterns, to recognize elements that are consistent or inconsistent with past experience	Break problems down into smaller components, to restructure them, to adapt familiar approaches, to develop new approaches	Brainstorm to challenge assumptions, to frame and answer "What if ..." questions, to suspend judgment pending appropriate tests
Presentation Software						
Use the components of presentation software creatively and effectively						
Demonstrate proficiency in using presentation software functions						
Database Applications						
Define and use the basic terminology of relational databases						
Use the tools and skills needed to create and utilize databases						
Principles of Programming						
Present basic programming principles and explain programming structures						
Design, code, build, test and troubleshoot basic custom applications						

Project and Process Flow Skills	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Research				
Identify and use traditional and non-traditional sources of information				
Apply effectively and choose appropriately from a variety of research methods and tools				
Analyze, organize and present research material				
Analysis and Synthesis				
Gather data to identify project requirements, and to interpret and evaluate the requirements				
Identify constraints, generate alternatives, consider risks and evaluate options				
Define the scope of work to meet project requirements and constraints, and develop a project outline				
Proposal Writing				
Explain the necessary elements of a proposal and their respective purpose				
Develop a proposal that meets the client's requirements and effectively presents the phases of the project				

Project and Process Flow Skills	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Planning and Organization				
Develop a project plan that is realistic and that effectively serves the project goals				
Organize the different phases of the project in an efficient manner				
Design and Development				
Apply the design and development process from beginning to end				
Evaluate and assess the effectiveness of the design and development process				
User Testing and Validation				
Develop and implement an effective testing and user validation program that supports all phases of the development process				
Technical and Project Documentation				
Select and use technical documentation formats meeting the intended purpose and the guidelines of the organization				
Develop effective and accurate technical documentation appropriate to various audiences and purposes				

Project and Process Flow Skills	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Quality Assurance				
Explain and apply quality assurance processes as they relate to the development process				
Discuss quality issues in a technology organization				

Coordination and Communication Skills	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Oral and Written Communication				
Select and evaluate appropriate communication strategies and styles for a specific purpose				
Develop effective written communication, and develop and deliver effective oral presentations				
Effectively adapt communication strategies and styles to specific audiences				
Customer Relations				
Effectively listen and ask critical questions to identify customer issues and concerns				
Resolve customer issues and concerns in a timely and appropriate manner				
Teamwork				
Work collaboratively in a team setting				
Work and communicate effectively with people of different backgrounds and expertise in a group environment				
Recognize expertise and learn from others				

Coordination and Communication Skills	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Task Management				
Organize multiple tasks in the most effective way, and allocate time and energy according to task complexity and priority				
Evaluate task outcomes and continuously improve organization process				
Project Management				
Explain the basic terminology, principles and techniques of project management				
Select, implement and evaluate appropriate project management techniques and tools				
Effectively adapt project management techniques to specific situations				

Business Environment Skills	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Business Organization and Environment				
Present and discuss contemporary business principles, practices and organization				
Present and discuss how computer systems impact the operation and management of business and society				
Computer Trends in Business and Society				
Discuss the issues affecting the selection of a computer system for a specific environment				
Present current computer technology and systems trends				
Discuss the impact of information technology on society and the workplace				
Principles of Accounting				
Explain and apply basic accounting principles				
Explain how computer applications support the financial workings of a business organization				
Professionalism				
Demonstrate successful work environment-related attitudes and skills				
Establish and maintain professional relationships				

Business Environment Skills	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Professional Development				
Identify and close gaps between one's knowledge and skills, and those required by the situation				
Identify sources of learning/training most appropriate for the topic and context, and for one's personal learning style				
Formulate and implement a personal development plan				

Analytical Skills and Problem Solving	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Problem Solving				
Select, implement and evaluate appropriate problem solving techniques and tools				
Effectively adapt problem solving techniques to specific situations				
Analytical and Logical Thinking				
Apply analytical and logical thinking to gathering and analyzing information, designing and testing solutions to problems, and formulating plans				
Conceptualization				
Visualize and articulate complex problems and concepts				
Data Gathering, Analysis and Organization				
Gather, analyze and organize data using a logical and systematic process				
Pattern Recognition and Modeling				
Recognize patterns in complex sets of data and develop practical models				
Hypothesis Development and Design of Experimentation				
Develop hypotheses and design test experiments				

Analytical Skills and Problem Solving	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Estimation and Cost/Benefit Analysis				
Develop estimates and projections, to conduct cost/benefit analysis on specific alternatives				
Statistical Analysis				
Apply statistical methods to analyze and resolve business and technical problems				

Core Computer Software and Hardware Skills	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Windows Environment				
Perform basic operations and troubleshoot basic problems in a Windows environment				
Customize the operating system environment				
Run multiple applications at the same time, and import and export data between applications				
Hardware Installation and Configuration				
Name individual parts that make up a stand-alone PC computer system, and describe the relationships between components				
Install and configure hardware in a PC computer system				
Perform basics of PC hardware troubleshooting and maintenance				
Software Installation and Configuration				
Install software programs and perform basic configuration operations				
Explain software and hardware compatibility issues				
Troubleshoot basic configuration problems				

Core Computer Software and Hardware Skills	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Network Technologies				
Present the characteristics of overall design and components of a LAN and WAN system				
Perform basic setup and configuration of network hardware and software				
E-mail				
Explain basic e-mail system components and organization				
Use e-mail effectively and appropriately				
Internet				
Use the Internet as a research tool in an efficient manner				
Create and maintain Web pages				
Word Processing				
Use basic word processing features, such as document formatting, editing and using tables				
Create simple word processing documents such as letters, memos and basic reports				
Create compound documents, such as newsletters, with graphics and objects from multiple software applications				

Core Computer Software and Hardware Skills	Data Gathering, Organization and Analysis			
	Identify and characterize needed data, and judge (in)sufficiency for task	Recognize unexpected evidence	Judge the reasonableness of results	Evaluate and analyze data leading to conclusions and decisions
Spreadsheet Applications				
Design, create, modify and troubleshoot spreadsheets				
Create graphs and charts				
Apply spreadsheet principles to real-life situations and to solve business problems				
Presentation Software				
Use the components of presentation software creatively and effectively				
Demonstrate proficiency in using presentation software functions				
Database Applications				
Define and use the basic terminology of relational databases				
Use the tools and skills needed to create and utilize databases				
Principles of Programming				
Present basic programming principles and explain programming structures				
Design, code, build, test and troubleshoot basic custom applications				

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Peter Saflund by Heather Sipple Peter Saflund, Associate Director

Organization/Address: NorthWest Center for Emerging Technologies
3000 Landerholm Circle SE, N258
Bellevue, WA 98007
425.564.4215 tel.
425.564.6193 fax
nwinfo@bcc.ctc.edu
www.nwcet.org

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